BLOCK 3 STUDY GUIDE

I. Objective 1a: Identify selected fuels and cryogenic safety concerns related to materiel management

A. Volatility: the ease with which a liquid will evaporate or vaporize

1. Low volatility: ignites at temperatures **above 110° F**

2. High volatility: ignites at temperatures **below 110° F**

B. Vapor Pressure: the outward pressure generated by vapors at certain temperatures

C. Flash point: the lowest temperature at which flammable liquids give off sufficient vapors, when mixed with air, to ignite **momentarily** (flash) on application of an ignition source

1. Flammable: liquids with a flashpoint **less than 100° F**

2. Combustible: liquids with a flashpoint **greater than 100° F**

D. Fire point: the lowest temperature at which a flammable liquid gives off sufficient vapors, when mixed with air, to **support combustion**

E. Freeze point: the temperature at which a liquid starts to form ice crystals

F. Density/Specific Gravity

1. Density: the weight of a substance per unit of volume

2. Specific Gravity: the ratio of the density of a product at 60° F to the density of an equal amount of distilled water

a. The specific gravity of fuel is less than that of water, thus fuel floats on water and water sinks to the bottom of a tank of fuel

G. Human Hazards

1. Benzene: colorless, flammable, and volatile liquid obtained from petroleum by refining distillation.

a. it is a carcinogenic substance (it causes cancer) and has a toxic effect on the **blood and blood forming tissues**

2. Tetraethyl lead: highly toxic to the **central nervous system**—enters the body via three routes

a. Inhalation

b. Ingestion

c. Absorption

3. Static electricity: **the number one enemy of fuels**

a. Grounding: a path or means to remove any electrostatic charge buildup on a conductive object to ground/earth

b. Bonding: electrically connecting two or more components of a system to equalize voltage potential

4. Fire Prevention: in order for a fire to occur a correct mixture of three necessary elements must be present—fuel, oxygen, and ignition source—the only element that can be controlled by fuels personnel is the ignition source

5. Protective Equipment: personal protective equipment (PPE) must be properly inspected and used/worn

6. Adverse Weather Conditions: the base weather station (BWS) is responsible for making the initial notification to predetermined support agencies like the Maintenance Operations Control Center (MOCC) and the Fuels Support Center (FSC) of adverse weather conditions

a. Lightning watch: in effect 30 minutes prior to thunderstorms being within five nautical miles

b. Lightning warning: in effect when any lightning is occurring within five nautical miles

7. Two Person Policy: two or more people must be present when the following operations are performed

a. Servicing aircraft, including refueling, defueling, and hot fueling

b. Issuing fuel to an organizational tank

c. Entering a confined space

d. Gauging and sampling above ground tanks

e. Generating or transferring cryogenic fluids

8. Safeguarding Equipment

a. Must have two (2) entry/exit points

b. Inhabited buildings and vehicle parking areas must have a separation of **100 feet**

c. Uninhabited buildings and vehicle parking areas must have a separation of **50 feet**

d. Parked vehicles must have a separation between each other of **25 feet center-to-center**

H. Cryogenics

1. Liquid Oxygen (LOX): a pale blue, non-toxic, water-like fluid that is extremely cold

2. Liquid Nitrogen (LIN): a colorless, odorless, non-flammable, non-toxic, and chemically inactive water-like fluid

3. Hazards of LOX and LIN

a. Physical hazards: primarily associated with phase change and low temperature effects of cryogens

b. Physiological hazards: asphyxiation (suffocation) and cryogenic burns

c. Chemical hazards: result from the chemical reactivity of LOX—reaction with hydrocarbons, oil, dirt, asphalt, and other foreign, organic materials that can result in explosions

I. Fuels Safety Program: Safety program is the responsibility of the flight commander

1. Fuels Safety Monitor duties

a. Provide section supervisors with **daily** safety briefing topics

b. Provide section supervisors with **weekly** environmental briefing topics

c. Brief all fuels personnel on pertinent safety matters **quarterly**

d. Conduct safety inspections of the entire fuels management activity **semi-annually (every 180 days)**

II. Objective 1b: Identify fuels storage processes

A. Filter Separator: removes fine sediment particles and coalesces and separates water from fuel

1. Fuel should pass through a **minimum of two filtrations** prior to issue/delivery to an aircraft

B. Visi-Flo: a transparent flange inserted at the offloading header to monitor fuel flow while offloading a tank truck—allows the storage operator a means to determine flow or no fuel flow conditions

C. Facilities Storage (Bulk Storage)

1. Inventory Management Plan (IMP): a document created by DESC through which the worldwide DOD petroleum posture is managed

2. Peacetime Operating Stock (POS): enough fuel to support your peacetime requirements

3. Bulk Petroleum War Reserve Stock (BPWRM): on-hand stock that is dedicated and set aside to fulfill a BPWRM requirement which is fuel that is required to be positioned prior to hostilities at or near the point of planned use

a. Inviolate Level: 85% of your BPWRM plus the unobtainable inventory in tank bottoms, manifolds, and pipelines.

i. This level may be penetrated for 72 hours as long as you have fuel scheduled to be delivered, but if the time exceeds the 72 hours you are required to report by telephone with a message confirmation later to your DESC service control point

4. Duties of the Facilities Supervisor: supervises facilities (bulk storage), service station, hydrants, and cryogenics storage (*except when a separate cryogenics production element is authorized*)

a. **Records deficiencies/malfunctions on AFTO Form 39**

5. Above Ground Storage Tanks

a. Fixed roof (cone roof): all weather tank, with a fixed roof containing a floating pan to eliminate the vapor space above the fuel

i. it has a 5° sloping floor with a water/dirt sump

b. Floating roof: has no fixed roof, rather the roof floats on top of the fuel and contains a fabric seal located between the outer rim of the roof and the tank shell

i. some floating roof tanks have had geodesic domes installed to protect them from the elements especially in cold weather climates

c. Secondary containment dikes: must be able to hold all of the tank’s capacity plus a **twelve-inch freeboard**

6. Tank Truck Receipt Procedures

a. Ensure sufficient ullage in the receiving tank

b. Properly position the truck in a manner to allow for rapid egress in case of emergency

c. Ensure the grade, quantity, and seal numbers agree with the DD Form 250

i. if they do not agree with the DD Form 250 contact the appropriate DoD quality assurance representative (QAR)

7. Settling Period: any time aviation fuel is received into bulk storage, allow the fuel to settle for a **minimum of eight (8) hours** before issue/transfer

a. This allows time for the static charges to dissipate

b. Tanks of 50,000 gallons or less and do not receive directly from the supplier do not require a settling period

c. Ground fuels do not require a settling period

8. Transferring Fuels

a. Communications must be established

b. **During the last 30 minutes** of transfer time, contact must be established **every 10 minutes** between the transfer and receiving points

9. Inventorying

a. Active tanks are inventoried on a **daily** basis **as of 2400 hours**

b. Inactive tanks equipped with a continuous leak detection system can be inventories monthly

D. Hydrant Systems

1. Type II (Pritchard): consists of a pump house with six or eight operating 50,000 gallon storage tanks

2. Type III (Constant Pressure): has **constant** pressure in the system

3. Type IV: pressurized **hot refueling** system

4. Type V: USAFE’s **in-shelter** refueling system

E. Cryogenics Storage: primary mission is to receive, store, transfer, inventory, and document transactions of Liquid Oxygen (LOX) and/or Liquid Nitrogen (LIN)

1. Heat Movement: heat can be moved in three ways:

a. Conduction: heat transferred by a solid

i. stainless steel supports are used to hold inner cryogenic tanks to prevent it from touching the outer tank to prevent conduction

b. Radiation: heat transferred by waves or rays

i. cryogenic tanks are painted white and keep them under covered sheds to prevent radiant heat from the sun from transferring to the product

c. Convection: heat transferred by fluid or air

i. maintaining a good vacuum in the annual space of each tank is necessary to prevent convection

III. Objective 1d: Identify fuels distribution processes

A. Fuels Support Center (FSC): composed of three sections—Fuels Expeditor, Mobile Distribution, Refueling Maintenance

1. Duties of the NCOIC Fuels Distribution: supervise Expeditors, Mobile Refueling, and Refueling Maintenance

2. Fuels Expeditor: serve as the eyes and ears of the FSC on the flightline as well as a technical advisor for fueling operations

3. Mobile Distribution

a. Tank Trucks

i. R-11: designed to deliver jet fuel; carries 6,000 gallons, pumps 600 gallons per minute, has 60 feet of hose, defuels at 175 gallons per minute

ii. C-300/301: designed to deliver ground fuel such as diesel fuel, MOGAS, and fuel oils; carries 1,200 gallons

1. the only difference between C-300 and C-301 is that the C-301 is four-wheel-drive

iii. R-12: self propelled, motorized hose cart that is primarily used with the Type III hydrant system

1. it holds no fuel it is basically a mobile filter/separator

iv. MH-2 Hose Cart: used to dispense fuel from a Type II Pritchard hydrant system

1. it is designed to meter and filter fuel from the hydrant to the aircraft

b. Vehicle Inspection Forms

i. AF Form 1807: for **special purpose vehicles**

ii. AF Form 1800: for **general purpose vehicles**

1. both of these forms must be completed by the operator each shift

4. Refueling Maintenance

a. Vehicle Checkpoint: only mobile refueling vehicles and general purpose vehicles used to support the daily mission requirements (e.g. the Expeditor’s pickup truck) are processed through the checkpoint for daily inspection

i. The typical preventative maintenance team consists of four (4) people

ii. Every vehicle must be inspected at the vehicle checkpoint at least every seven (7) days

IV. Objective 2b: Restate fuels accountability requirements and related processes

A. Fuels Automated System (FAS)/Fuels Manager Defense (FMD): an Automated Information System (AIS) designed to support the DESC and military services in performing their responsibilities in fuel management and distribution

B. Composed of two levels:

1. Base Level

a. Composed of two separate systems

i. Supervisory Control and Data Acquisition (SCADA): manages tank farms, terminals, pipelines, airfield distribution systems, and other management systems

ii. Fuels Control Center (FCC): supports fuel requests, flightline management, asset management, customer accounting, and product quality control

b. Interfaces with PETROL RAM: office responsible for three major components of the base level system

i. Automated Fuels Service Station (AFSS)

ii. Automated Tank Gauging (ATG)

iii. Automated Data Collection (ADC)

2. Enterprise Level (also called “Purple Hub”): provides users with graphical user interface into a fully DOD compliant air and ground fuel management and accounting system

C. Fuels Requisition Process

1. For aviation fuels: use the Source Identification and Ordering Authorization (SIOATH)

2. For ground fuels: use the Contract Bulletins

3. For cryogenics: use the Government-Wide Purchase Card (GWPC)

D. Reporting Inventory

1. DESC requires as a minimum a **weekly** inventory to be accomplished as of 0800 local each Friday and a **monthly** inventory to be accomplished as of 0800 local on the first calendar day of every month

a. Reports shall be in increments of 1,000 barrels (MBBL) which equals 42,000 gallons

b. 1 barrel = 42 gallons

2. Determinable Variances: fuel losses at Defense Fuel Supply Points (DFSP [also known as bases]) which are readily measurable and not considered routine operating losses—fall into three main categories:

a. Peacetime losses: cause by pipeline ruptures, tank overflows, spills, fires, and unrecoverable tank bottoms

b. Combat losses: caused by hostile activity in a combat environment where fuel is contaminated or destroyed

c. Major disasters: cause by nature such as hurricanes, floods, storms, lightning, or earthquakes

V. Objective 2c: Describe guidelines for collecting, segregating, and processing recoverable and waste petroleum

A. Terms

1. Reclaimable Product: product of a known or determinable quality that can be used for original grad without reprocessing

2. Waste Product: product no longer suitable for use because of excessive contamination or degradation

3. Recoverable Product: re-firing, clay filtering, or naphtha injection to bring an off-specification product up to specification

B. Hazardous Waste Characteristics

1. Ignitability: can be lighted easily or burns so vigorously and persistently when ignited it creates a hazard

2. Corrosivity: dissolves metals and other materials or burns the skin or eyes on contact

3. Reactivity: is normally unstable and undergoes rapid or violent chemical reactions

4. Toxicity: has high concentration of poisonous heavy metals or certain organic compounds that may cause illness and/or death if inhaled, swallowed, or absorbed through the skin

C. Uniform Hazardous Waste Manifest: a form used to track hazardous waste from generation to disposal